

Name

Key

Period

MODELING: THE SURFACE AREA TO VOLUME RATIO OF A CELL

INTRODUCTION: Cells are limited in how large they can be. This is because the surface area and volume ratio does not stay the same as their size increases. Because of this, it is harder for a large cell to pass materials in and out of the membrane, and to move materials through the cell.

~~In this lab, you will make cube shaped models to represent cells. The dimension along one side will be doubled with each model. You will then calculate the surface area, volume, and the ratio between the two.~~

DATA TABLE: Cell size comparison.

Cell	Dimensions (cm)	Surface Area (cm ²) (length x width) x 6 sides	Volume (cm ³) length x width x height	Ratio: Surface area to Volume ratio = $\frac{\text{surface area}}{\text{volume}}$
1	1 x 1 x 1	1 x 1 x 6 6 cm ²	1 x 1 x 1 1 cm ³	$\frac{6 \text{ cm}^2}{1 \text{ cm}^3} = 6/\text{cm} = 6:1$
2	2 x 2 x 2	2 x 2 x 6 24 cm ²	2 x 2 x 2 8 cm ³	$\frac{24 \text{ cm}^2}{8 \text{ cm}^3} = 3/\text{cm} = 24:8$
3	4 x 4 x 4	4 x 4 x 6 96 cm ²	4 x 4 x 4 64 cm ³	$\frac{96 \text{ cm}^2}{64 \text{ cm}^3} = 1.5/\text{cm} = 96:64$
4	8 x 8 x 8	8 x 8 x 6 384 cm ²	8 x 8 x 8 512 cm ³	$\frac{384 \text{ cm}^2}{512 \text{ cm}^3} = .75/\text{cm} = 384:512$

These ratios show how many times larger the surface area is as compared to the volume. Notice that it becomes less than one very quickly.

QUESTIONS:

Which model has the largest surface area? 8 x 8 x 8

Which model has the largest volume? 8 x 8 x 8

helpful websites: ① staff.jccc.net/pdeccl/cells/cellsizes.html

② www.hillstrath.com/calculator/bio3a/cellbio/sa-vsoln.htm